Received December 12, 1765.

XXXIV. *On the Tranſit of* Venus *in* 1769.

To the RIGHT HONOURABLE

The Earl of MORTON, Preſident,

To the COUNCIL and FELLOWS

Of the ROYAL SOCIETY,

This DISCOURSE is, with all Humility, inſcribed,

By their humble Servant,

Thomas Hornſby.

Read Feb. 13, 1766.

THE obſervations of the late Tranſit of Venus, though made with all poſſible care and accuracy, have not enabled us to determine with certainty the real quantity of the ſun's parallax; ſince, by a compariſon of the obſervations made in ſeveral parts of the globe, the ſun's parallax is not leſs than $8''\frac{1}{2}$, nor does it ſeem to exceed $10''$. From the labours of thoſe gentlemen, who have

attempted to deduce this quantity from the theory of gravity, it ſhould ſeem that the earth performs its annual revolution round the ſun at a greater diſtance than is generally imagined: ſince Mr. Profeſſor Stewart has determined the ſun's parallax to be only 6″, 9, and Mr. Mayer, the late celebrated Profeſſor at Gottingen, who hath brought the lunar tables to a degree of perfection almoſt unexpected, is of opinion that it cannot exceed 8″ *.

In this uncertainty, the aſtronomers of the preſent age are peculiarly fortunate in being able ſo ſoon to have recourſe to another tranſit of Venus in 1769, when, on account of that planet's north latitude, a difference in the total duration may conveniently be obſerved, greater than could poſſibly be obtained, or was even expected by Dr. Halley, from the laſt tranſit.

The experience which we gained in the year 1761, the knowledge of the errors, from whatever cauſe they may ariſe, which muſt unavoidably be committed in obſervations of this kind, will enable us to put in practice every method of ſolving this problem, and to determine with what degree of accuracy, and within what limits, the true quantity of the ſun's parallax may be obtained, and conſequently the dimenſions of the whole ſolar ſyſtem.

But, before I proceed to give a computation of the effect of parallax at the ſeveral places where this tranſit ought to be obſerved, it will be neceſſary to premiſe the principles upon which the general calculus was

* Mr. Machin, Profeſſor of Aſtronomy at Greſham College, deduced the ſame quantity many years ago. See a tract entitled *The Laws of the Moon's Motion according to Gravity*, p. 24.

formed.

formed. Having found, by computing the obfervations made on the tranfit in 1761, that, when the Abbé de la Caille's folar tables are ufed, the epoch of the mean motion of Venus for 1761, as given in Dr. Halley's tables, requires a correction of $+ 52'' \frac{1}{2}$; and that the place of the afcending node was, at the beginning of the fame year, in $2^s. 14^\circ. 31'. 10''$: having collected alfo, by computing the obfervations of Mr. Horrox in 1639, with the affiftance of Dr. Halley's tables of Venus, and the folar tables abovementioned, that the motion of the planet's mean longitude is $6^s. 19^\circ. 12'. 22''$, and of the node $52'. 18''$, in 100 Julian years: I have fuppofed the mean longitude of Venus, in the beginning of the year 1769, to be $0^s. 5^\circ. 23'. 48''$, and the place of the node to be in $2^s. 14^\circ. 35'. 21''$—; and have affumed the reft of the planet's elements as given in Dr. Halley's tables. According to thefe numbers, and the Abbé de la Caille's folar tables, the ecliptic conjunction will happen on June 3d, 1769, at $9^h. 59'. 24''$ mean time at Greenwich, the planet's geocentric latitude being $10'. 13'',5$ N. The log. of the earth's diftance from the fun = 5.0065166; the log. of Venus's diftance from the fun = 4.8610947; and of the planet's diftance from the earth = 4.4606784; and the equation of the præceffion of the equinoctial points = $+ 17'',7$. By computing the geocentric longitude and latitude of the planet three hours before and three hours after the ecliptic conjunction, I find the planet's hourly motion from the fun in the ecliptic = $3'. 57'',7$; the hourly motion in the relative orbit = $4'. 0'',3$; the hourly motion in latitude = $0'. 35'',45$; the angle of the planet's path with

with the ecliptic $= 8^{\circ}. 29'. 02''$; the angle of the ecliptic with the equator $= 7^{\circ}. 02'. 54''$; and therefore the angle made by the planet's visible path with the equator $= 15^{\circ}. 31'. 56''$. The geocentric latitude is, as has been observed, $= 10'. 13'',5$: and hence it is easily determined that the least distance of the centers will be $10'. 06'',8$, and the interval between the time of the ecliptic conjunction and the middle of the transit $= 22'. 21''$. of time. As the planet has not yet passed its node, the middle of the transit will therefore be at $10^{h}. 21'. 45''$ mean time at Greenwich. In every inferior conjunction the motion of Venus is retrograde, and therefore the effect of the aberration of light in long. $= 3'',7$, when reduced to time $= 55''$, is to accelerate the several phases of the transit; the equated mean time of the middle, therefore, will be at $10^{h}. 20'. 50''$. But the place of the planet is also affected by the aberration of light in latitude; and as Venus's latitude is decreasing, the least distance of the centers will be increased by $1'', 35$. The equated least distance of the centers, therefore, will be $10'. 08'', 15$. Now, supposing the semi-diameter of the sun $= 15'. 45'',6$, and of Venus $= 29''$, the semi-durations, or intervals between the middle and the external and internal contacts, will be found $= 3^{h}. 10'. 08''5$, and $2^{h}. 51'. 13'',2$. The equation of time is about $2'. 14''$ at the middle of the transit, by which quantity the apparent time is before the mean, and decreases at the rate of about $2''$ in 6 hours. Therefore the apparent times of the several phases of this transit for the meridian of Greenwich are as follows.

 First

	App. time. h	′	″
First external contact, June 3,	7	12	56
Total ingress —— ——	7	31	52
Middle —— —— ——	10	23	04
Beginning of egress —— ——	13	14	16
Last contact —— ——	13	33	11

Hitherto we have had no regard to parallax, and the above times are such as would be observed from the earth's center. To the British isles, and to the neighbouring parts of the continent, the effect of parallax is nearly at a maximum, and will considerably accelerate the times of external contact and ingress. If we suppose the sun's parallax on the day of the transit $=8'',7$, the horizontal parallax of Venus from the sun will be $21'',87$; and the times of the external and internal contacts visible in England will be accelerated by the joint effects of parallax, both in the direction of the planet's path and perpendicular to it; the former by $7'.\ 09''$; the latter by $7'.\ 12''$. And therefore Venus will be seen to touch the sun's limb at $7^h.\ 5'.\ 47''$, more than an hour before the time of sun-set; when the apparent altitude of the planet above the horizon will be about 8 degrees: and the total ingress will happen at $7^h.\ 24'.\ 40''$, when the planet's altitude will exceed 5 degrees.—— If the sun's parallax should be one second larger than we have supposed, or $9'',7$, the time of ingress will happen at $7^h.\ 23'.\ 51''$.

These times are not here given with any great degree of confidence: but as the errors in the planet's orbit will, in June 1769, be nearly the same with those

those which were observed 8 years before, it may be presumed that the foregoing computation will be found not to differ very widely from the truth.

Having rectified the globe to the declination of the sun at the middle of the transit $= 22°. 26'. 40''$, and also at the times of the two internal contacts, I find that the whole transit will be visible to a considerable part of Swedish Lapland, the northernmost parts of Asia, and the northern and N. W. parts of North America; for the circle of illumination at the first internal contact passes along the western coast of Africa from Cape Verd through the Straits of Gibraltar to Clermont in France, leaving Paris about a degree and a half to the West; from thence it passes through Germany and along the Baltic Gulf, through Wibourg and Archangel, along the northern coast of Asia; and then traversing the N. E. parts of Siberia, it passes over Japan, enters the great Atlantic ocean, leaves the Marian isles and New Zealand on the West, and running round Cape Horn, and near Falkland isle, passes on to Cape Verd through the Ethiopic ocean, in a direction nearly parallel to the eastern coast of South America. All places situated under the first part of this line from Nova Zembla towards Cape Horn will see Venus enter upon the sun at the time of sun-setting, and at sun-rising under the other half of it. — The circle of illumination at the beginning of egress enters Europe to the North of Drontheim in Norway, and crossing the Bothnic and Finland gulfs, passes over Muscovy and the Caspian sea; and running through Persia traverses the Arabian gulf, going southward near the isles of Maldivia, and taking a large circuit towards the South

Pole,

Pole, returns through Mexico, Louisiana, Canada, and the southern parts of Greenland, to Drontheim. So that almost all Africa is deprived of a view of this transit, and a very considerable part of Europe.

If we examine the observations of the transit in 1761, in places where there were more observers than one, and where the contacts were observed when the sun was near the horizon, and at higher altitudes, we may safely conclude that the observations will be made with sufficient accuracy when the sun is at such altitudes above the horizon, as not to be greatly affected by the vapours. At the Observatory at Upsal, when the sun's altitude at the ingress was $3\frac{1}{2}$ degrees, three observers differed $22''$, whereas at the egress, when the sun was $44°\frac{1}{4}$ high, the difference amounted only to $6''$. It should seem, therefore, that observers ought not to be sent to places where the sun will be much less than $5°$ high at the time of either of the contacts.

It appears by computation, that the joint effect of the parallaxes both in longitude and latitude to lengthen the total duration, will be the greatest to those places which are about $24°$ or $25°$ to the East of Greenwich in the 66th or 67th degree of N. latitude, when the sun's altitude is about $5°$ at each contact, or if the sun's altitude at each contact be required $= 10°$, the latitude of places under the same meridian must be $73°$ or $74°$ N. In the former case, this transit may be very advantageously observed at Tornea°, Kittis, and the adjoining parts of Swedish Lapland; in the latter, at Wardhus, and in the neighbourhood of the North Cape: for an error of one or two degrees either in longitude or latitude will make but

but a very inconſiderable difference in the parallactic time; as will ſufficiently appear from an inſpection of the following Table, which contains the joint effect of the parallaxes of longitude and latitude in accelerating the times of the two internal contacts at Tornea°, Kittis, and Wardhus, for each of which places the parallactic angle, or the angle made by a vertical circle with the orbit of Venus, was carefully computed.

	Firſt intern. contact	Second intern. contact	Total effect of par. = 8″,7	Total effect of par. = 9″,7	Difference for 1″ of parallax.
	′ ″	′ ″	′ ″	′ ″	′ ″
Tornea°	6 53	4 47	+ 11 40	+ 12 58	1 18
Kittis	6 51	4 43	+ 11 34	+ 12 51	1 17
Wardhus	6 38	4 41	+ 11 19	+ 12 37	1 18

Having determined the greateſt effect of parallax in lengthening the total duration at ſuch places to which obſervers may conveniently be ſent, let us examine how far we may be enabled to obtain obſervations in ſuch parts of the earth's ſurface where the effect of parallax will be contrary; and conſequently where the total duration will be as ſhort as poſſible. By the aſſiſtance of calculation it may be found, that in the latitude of about 54° South, and in 155° of Weſt longitude nearly, the total duration will be the ſhorteſt, when the ſun's altitude is 5°; or in about 47° of South latitude under the ſame meridian, when the ſun is 10° high. And accordingly, by computing the parallactic angle for the latitude of 55° South, and the meridian oppoſite to that of Tornea°, I find

4 that

that the total duration will be ſhortened by parallax no leſs than 12′ 53″, ſuppoſing the ſun's parallax $= 8'',7$. and conſequently that there might be obſerved a difference in the total duration between this place and Tornea° of 24′ 33″: a difference conſiderably greater than was expected by Dr. Halley in 1761; and, ſuppoſing with that aſtronomer, that the obſervations at each contact may be taken true to a ſingle ſecond, (which indeed experience will not warrant) ſufficient to determine the ſun's parallax within $\frac{1}{750}$th part of the whole.

But as this and the other point fall in the great South ſea, where it does not certainly appear that there is any land, let us enquire in what parts of the South ſea we may reaſonably expect to find land. From the accounts of ſome of the circumnavigators, it ſhould ſeem that there are iſlands ſcattered here and there about the tropic of Capricorn, particularly the iſland or iſlands of St. Peter, in about 150° of W. longitude from Greenwich, and in about 21° of S. latitude. I have therefore computed the parallactic angle for a place 10^h 22′ 50″ to the Weſt of Greenwich, and in 21° of S. lat. and find that the ingreſs will happen 6′ 10″ later, and the beginning of egreſs 6′ 6″ ſooner, than if ſeen without parallax; that the total duration is therefore ſhortened 12′ 16″ by parallax; and conſequently that there is a difference of 23′ 56″ in the total duration between Tornea° and this iſland, ſuppoſing the ſun's parallax $= 8'',7$ on the day of the tranſit; or of 26′ 39″, if that parallax be ſuppoſed $= 9'',7$.

About the latter end of the 16th century, Don Pedro Fernandez de Quiros made two voyages for the

discovery of the southern continent and islands, under the patronage of the Viceroy of Peru. From several memorials which he presented to the court of Spain in the year 1609, with a view to procure a settlement of the countries he had actually discovered, it appears that he had found many islands, and particularly a large tract of land lying in or near the 15° of S. latitude, well peopled and well cultivated, the inhabitants generally of a peaceable disposition. The produce of this country is represented to be such as to render it a fit object to any commercial nation; consisting of gold, silver, pearl, spices of many sorts, and sugar-canes. He describes several safe and commodious harbours, particularly Puerto de la Vera Cruz in lat. 15° 40′ S. capable of holding 1000 ships, with a safe anchorage in every part; and where he himself actually staid thirty-six days with three ships. From the wholsomeness of the air, the fertility of the soil, and many other circumstances peculiar to this continent, he makes no scruple to prefer it to every country which the Spaniards had conquered whether in the E. or W. Indies *.—I must, however, observe, that, if this country be 195° to the W. of London, the whole of the transit, in all probability, will not be visible; as Venus will enter wholly upon the sun's disk at, or a few minutes before, the time of sun-rising.

The Spaniards gave the name of the Islands of Solomon to certain countries in the South seas, reported to be very rich in gold. They were first discovered by Alvarez de Mendoza in 1527, and are supposed by some to be the very lands which were afterwards found by Fernandez de Quiros. The Spaniards

* Harris's Voyages, 2d Edit. Vol. I. p. 63.

are ſaid to have had very clear and ſatisfactory accounts of theſe iſlands; but to have deſtroyed them for political reaſons, by expreſs orders from Old Spain, when Sir Francis Drake ſailed into the South ſeas *. Their ſituation is not known; and from ſome fruitleſs attempts to find them, it has been, and is ſtill, perhaps, queſtioned whether there be any ſuch iſlands. — Some time after the year 1720, while Capt. Betagh, Commander of the Marines on board of Capt. Shelvocke's ſhip, was in Peru, the diſcovery of theſe iſlands was again attempted, upon ſome freſh information, by command of the Viceroy †; but without ſucceſs: for the latitude of theſe iſlands is not even nearly known. They are, however, ſuppoſed to lie between the 10th and 20th degree of S. latitude, in about 175° of W. longitude from London, according to the beſt Engliſh and French maps: or, according to ſome geographers, theſe iſlands are only 120° to the W. of London.

Soon after the government of the Dutch in the Eaſt Indies was ſettled at Batavia, it was thought proper by the Dutch Eaſt-India company that an exact ſurvey of their countries already diſcovered ſhould be made and preſerved. For this purpoſe Capt. Abel Janſen Taſman ſailed from Batavia in 1642. In this voyage ſeveral lands were diſcovered, particularly the two iſlands of Amſterdam and Rotterdam, lying in 21° and 20° of S. latitude and in 173° or 174° of W. Longitude. The iſlanders are repreſented to be of a civil and peaceable diſ-

* Harris's Voyages, 2d Edit. Vol. I. p. 63.
† Id. ib. p. 245.

poſition,

position, and to all appearance unacquainted with the use of arms; the lands well cultivated, and planted with all kinds of fruit-trees *.—Not far from these two islands are nineteen or twenty more, in 17° or 18° of S. latitude, and 4° or 5° to the W. of the former.

Mr. de Chabert, in the Memoirs of the Academy of Sciences for 1757 †, has given an account of four islands in the South sea, lying in about 10° of S. latitude, and 134° or 135° to the West of London, discovered in July 1595, by Alvaro Bendano de Neyra, commander of a Spanish squadron of four ships, in his second voyage for the discovery of the Solomon-isles.

" The first and easternmost he named the Island " of Magdalene. It is about six leagues in circuit, " with high coasts and mountains in the middle; and " is extremely well peopled. More than forty In- " dians came on board the ship.

" To the N. W. at the distance of about ten " leagues, lies the island of St. Peter, near three " leagues in circuit, and presenting an agreeable " prospect to the eye.

" About five leagues to the S. W. of St. Peter is " another and larger island, named Dominica, about " fifteen leagues in circumference, well peopled, and " affording beautiful prospects.

" To the South of this island is St. Christine, near " eight leagues in circumference.

* Harris's Voyages, 2d Edit. Vol. I. p. 327.

† Memoires de l'Academie des Sciences pour 1757, p. 50.

" The whole squadron passed between this island " and Dominica, and anchored in a very good ha- " ven, to the West of St. Christine, in the latitude " of 9° 30′; near which they found a rivulet of " very fine and fresh water. The coasts of all the " islands seemed in general very safe and commodi- " ous for shipping.

" In this harbour they found all kinds of re- " freshment; as fowls, hogs, sugar-canes, plan- " tanes, cocoa nuts, and many sorts of other fruits.

" They conversed with the natives of the country, " and erected three crosses."

Besides the countries already mentioned, it should seem from Mr. de Lisle's map of the southern hemisphere, that there are many islands situated between the parallels of 5° and 23° of South latitude in the great Pacific Ocean; the most remarkable of which, together with those already mentioned, are given in the following Table.

	W. Lon.	S. Lat.
Island of St. Peter, according to some maps	130	18
Islands of Mendoza	135	9½
Islands discovered by Quiros, 1605	138	21
Isles des Tiburons, or Dog Island	141	16
Isle Habitée	144	17
Islands of St. Barnard	150	11
Water Island	151	15
Fly Island	153	15½
Land discovered by Mendana	157	4
Isle de la Belle Nation	160	12
Island of Jesus	162	7
Rotterdam I.	173	20½
Amsterdam I.	174	21
Solomon Isles	175	10
Island of Taumaco	177	13
Prince William Islands	178	17
Terra Australis	190	15

It

It appears, I think, not only poſſible, but highly probable, that obſervers may be ſtationed in the South ſeas. I have, therefore, computed the parallactic angle for different longitudes and latitudes, anſwering to ſuch places whoſe poſitions ſeem to be moſt certainly known; the reſult of which calculations is given at one view in the following Table.

W. long.	S. lat.	Places Names.	Firſt intern. contact	Second intern. contact	Tot. eff. of par. =8″,7.	Difference in tot. dur. from Torneaº.
			′ ″	′ ″	′ ″	′ ″
155 42	21 0	Iſland of St. Peter	6 10	6 06	12 16	23 56
135 0	9 30	Mendoza Iſles	4 31	6 49	11 20	23 00
173 0	20 30	Amſterdam and Rotterd. I.	6 19	4 42	11 01	22 41
190 0	15 0	Terra Auſtralis	5 43	3 16	8 59	20 39

By the laſt column it appears, that if an obſerver be ſtationed in any of the above places, perhaps in any part of the South ſeas where the whole tranſit is viſible, and the total duration obſerved there be compared with that at Torneaº, we may obtain a difference in time from 20 to 24 minutes; which is indeed ſo conſiderable, that the ſun's true diſtance muſt be aſcertained more exactly than can poſſibly be expected from any other method.

But, if it ſhould be found impracticable to ſtation an obſerver in the South ſeas, the loſs may in a great meaſure be repaired, if the tranſit be obſerved in ſuch parts of North America where the whole is viſible. At Mexico the total ingreſs will happen when the ſun is very near the meridian; and, if the longitude of the place and the general computation may be depended upon, the beginning of egreſs will happen towards the time of ſun-ſet, when the apparent altitude of the ſun will not much exceed four degrees.

 Obſervers

Obſervers therefore ſhould be ſtationed farther to the Weſt about Cape Corientes; at which place and at Mexico, though in about 20° of N. latitude, the effect of parallax will ſtill be conſiderable, particularly at the egreſs, as appears from the following Table.

Places.	Firſt internal contact.	Second internal contact.	Total effect of par. $=8'',7$.	Difference in tot. dur. from Tornea°.
	′ ″	′ ″	′ ″	″ ″
Mexico	1 07	5 03	6 10	17 50
Cape Corientes	0 26	5 00	5 26	17 06

By comparing the obſervations to be made at either of the above places, or in any of the neighbouring parts, with thoſe of Tornea°, a difference of more than ſeventeen minutes in the total duration may commodiouſly be obtained; by which the quantity of the ſun's parallax may be determined agreeably to the method propoſed by Dr. Halley in the caſe of the laſt tranſit, and in which no error but that of the obſervation can take place, ſuppoſing the ſituation of the two places to be nearly known.

When Dr. Halley's computation was examined, and it was found that ſo great a difference in the total duration of the tranſit at any two places as had been expected could not conveniently be obtained; another method was propoſed, and was accordingly carried into execution, viz. to ſtation two obſervers in ſuch a manner that one of the internal contacts might be obſerved with the greateſt difference poſſible ariſing from a contrary effect of parallax at the two places. This method, though neceſſarily inadequate, becauſe

becaufe the longitude of the two ftations muft be rigorouſly known, may be practifed at both contacts in 1769.

It appears by computation that the time of the firft internal contact in the evening is accelerated as much as poffible by parallax in 48° 42′ of N. latitude, and 6° to the Eaft of Greenwich, at or near Nancy in France. But this computation is framed upon a ſuppofition that the fun's center is in the very horizon: in which circumftances no obfervation can be taken. If the fun's altitude at the time of the contact fhould be required equal to 5 or 10 degrees, then it will appear that Greenwich and Dublin are ftations very advantageous; and we have already feen that the time of ingrefs at the former place will happen 7′ 12″ fooner than if feen from the earth's center, on account of parallax. Indeed the effect of parallax will be nearly the fame to every part of Great Britain. The part of the earth's furface, where the effect of parallax upon the planet at the fame contact will be as great as poffible in a contrary direction, when the fun's altitude is about 5°, is in 46° of S. latitude nearly, and in 168° or 169° of W. longitude from London, in the great Pacific Ocean, where it does not at prefent appear that there is any land. If, however, an obferver fhould be ftationed in any of the iflands in the South fea, for which a computation has already been made, even in the iflands of Mendoza, the morning ingrefs will be found to be retarded by parallax 4′ 31″; and confequently a difference at this contact of 11′ 43″ may be obtained by comparing the obfervation of the firft internal contact with the obfervations at Greenwich; or 11′ 24″, if the fame obfervation be compared with that at Tornea°.

In order to ſee the beginning of egreſs accelerated by the greateſt effect of parallax poſſible, when the altitude of the ſun is 5°, an obſerver muſt be ſtationed in about 123° of Weſt longitude from London, and in about 19° of S. latitude; or, as it does not appear at preſent that there is land there, the obſerver may be ſtationed with conſiderable advantage either in the iſlands of Mendoza, or in the iſland of St. Peter. The ſame contact will be as much retarded on account of parallax to an obſerver placed under the tropic of Cancer, in about 67° of E. longitude from London. This point indeed falls into the Gulf of Sindi; but as a difference of many degrees, either in longitude or latitude, will occaſion but a very inconſiderable difference in parallactic time, this contact may be very advantageouſly obſerved on any part of the coaſt from the mouth of the Indus to Cape Comorin, and from thence along the coaſt of Coromandel and Golconda as far as the mouth of the Ganges. It may naturally be expected that the end of the tranſit will, if the weather be favourable, be obſerved at many of our own ſettlements in theſe parts: I have therefore computed the effect of parallax at the egreſs for Madraſs and Calcutta, at which places the laſt tranſit was obſerved; and find that the time of the ſecond internal contact will happen 6′ 41″ later on account of parallax at the former, and 6′ 44″ at the latter, than if ſeen from the earth's center. By comparing the obſervations made at either of the above places with the correſponding obſervation at Mexico, we may obtain a difference of 11′ 44″; a difference greater than could be obtained by any obſervations that could conveniently be made at the egreſs in the tranſit of 1761.

Upon

Upon the whole, the neceſſity of ſending an obſerver into the South ſeas ſufficiently appears, whether it be propoſed to determine the ſun's parallax by the difference in the total duration of the tranſit, or by the obſervations of the internal contacts either at the ingreſs or egreſs. For if there ſhould happen to be no land in the meridian oppoſite to Tornea° and in about 21° of S. latitude; yet if an obſerver can be ſtationed either in the iſlands of Mendoza, or in the iſlands of Amſterdam and Rotterdam, a difference in parallactic time will be obtained as in the following Table.

Places compared.	Difference in total duration.	Difference at ingreſs.	Difference at egreſs.
	′ ″	′ ″	′ ″
Tornea° and Mendoza Iſles	23 00	11 24	11 36
Tornea° and Amſterdam or Rotterdam	22 41	13 12	9 29
Tornea° & the opp. merid. in 21 S. lat.	23 56	13 03	10 53

If the ſky ſhould prove favourable, the obſervations made at Tornea° and in any of the above places will enable us to determine the ſun's parallax with great preciſion, and independent of the exact knowledge of the longitude of either place. But as the ſituation of Tornea° is perhaps very exactly known, if it ſhould be convenient to the ſouthern obſerver to continue long enough upon his ſtation to determine the exact longitude of it, to which the ſituation of Jupiter at that time will greatly contribute, both methods might be practiſed at the ſame time, and they would mutually confirm and illuſtrate each other.

An opportunity of obſerving another tranſit of Venus will not again offer itſelf till the year 1874. It behoves us therefore to profit as much as poſſible by

by the favourable ſituation of Venus in 1769, when we may be aſſured the ſeveral Powers of Europe will again contend which of them ſhall be moſt inſtrumental in contributing to the ſolution of this grand problem. Poſterity muſt reflect with infinite regret upon their negligence or remiſſneſs; becauſe the loſs cannot be repaired by the united efforts of induſtry, genius, or power. How far it may be an object of attention to a commercial nation to make a ſettlement in the great Pacific Ocean, or to ſend out ſome ſhips of force with the glorious and honourable view of diſcovering lands towards the South pole, is not my buſineſs to enquire. Such enterprizes, if ſpeedily undertaken, might fortunately give an advantageous poſition to the aſtronomer, and add a luſtre to this nation, already ſo eminently diſtinguiſhed both in arts and arms.

Oxford, December 1, 1765.